Comparing algorithms performance for monitoring endemic disease: a simulation study based on the Danish PRRSV monitoring program

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Comparing algorithm performance for monitoring endemic disease: a simulation study based on the Danish PRRS monitoring program.

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Introduction and objectives

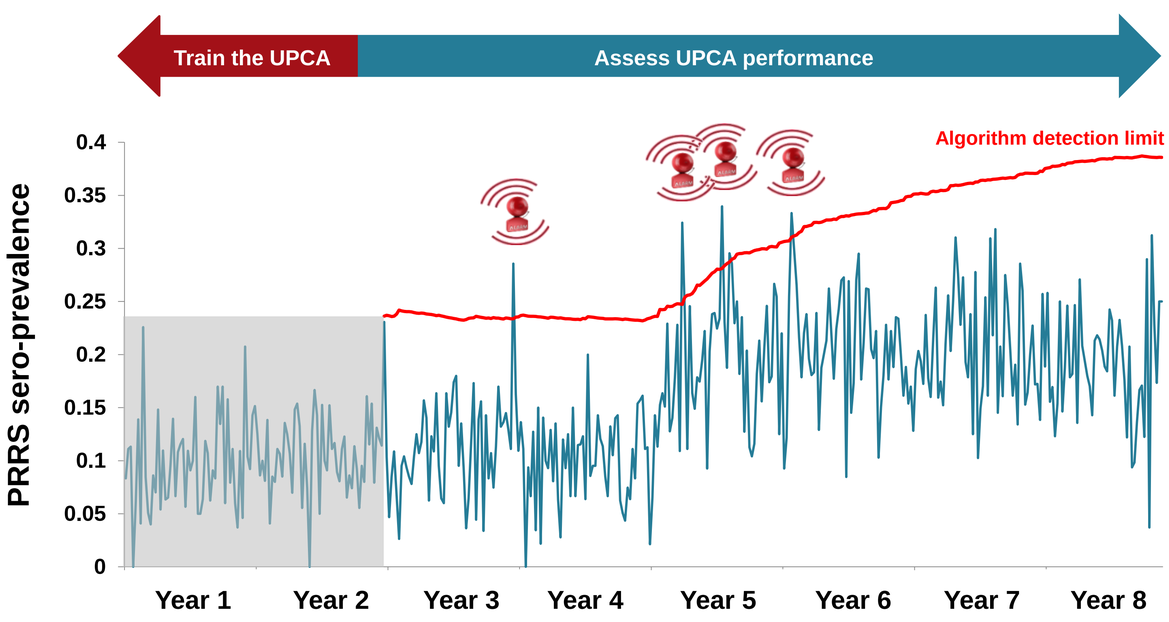
- The use of statistical process control for monitoring endemic diseases has so far been unexplored.
- In this case, it is important to monitor changes of disease prevalence, which might indicate disease spread, allowing control efforts to be triggered immediately. **So…**

Let's investigate the performance of univariate process control algorithms (**UPCA**) to detect changes in PRRS sero-prevalence and assess the effect of the sample size in their performance.

Methods

A. Time-series analysis

- Simulate increases on the weekly PRRS sero-prevalence from 0.10 to 0.15 and 0.20 based on 1, 10 and 100 times the weekly number of swine herds tested for PRRS.



B. UPCA tested

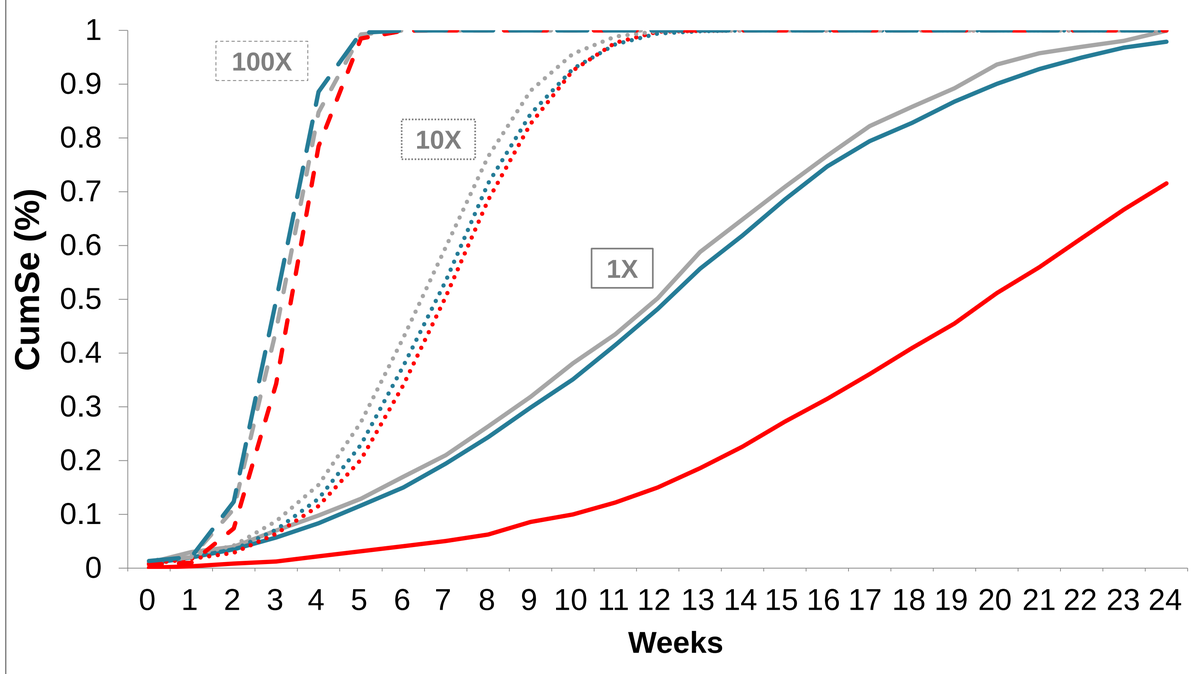
- **Exponential Weighted Moving Average (EWMA)**
- **Cumulative sum (CUSUM)**
- **P Shewart (PSHEW)**

C. Performance evaluation

- Cumulative sensitivity (CumSe): cumulative % of 2000 iterations in which an alarms was raised after the increase was started.

Results

The results are represented for increases in the sero-prevalence from 0.10 to 0.20 over 24 weeks for different sample sizes and each color corresponds to an UPCA.



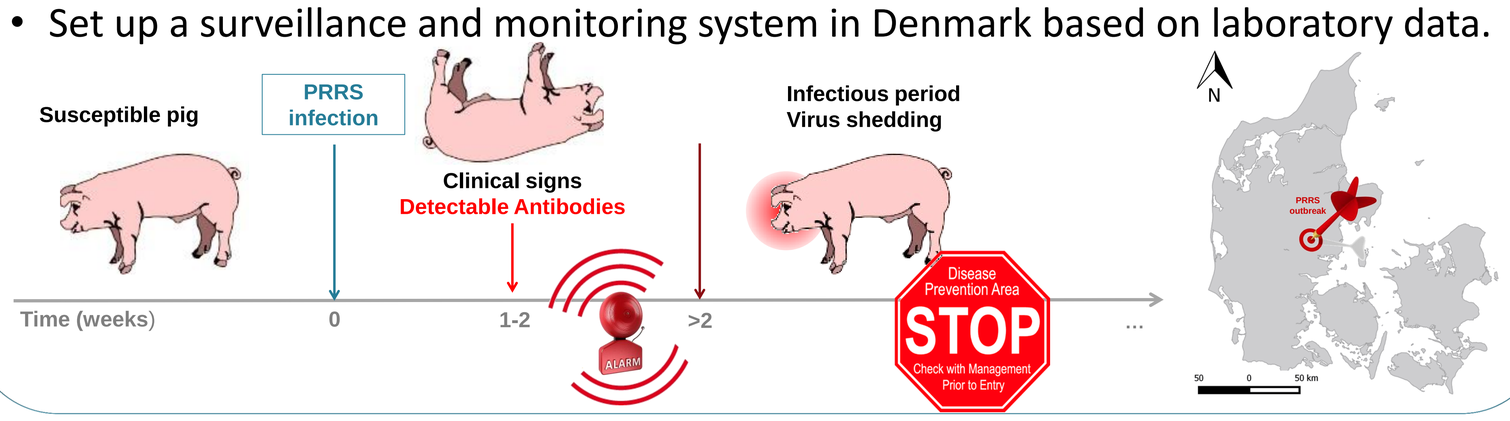
- **PSHEW** and **EWMA** had higher CumSe when compared with the **CUSUM** for the different simulated scenarios.
- Increasing the sample size 10x halved the time to detection (CumSe=1), whereas 100x reduced the time to detection by a factor of 6.

Conclusions

- Small changes in diseases sero-prevalence can be detected by using these algorithms.
- Increasing the sample size provides a faster detection for PRRS.

Perspective

- Set up a surveillance and monitoring system in Denmark based on laboratory data.



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